IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.

1. (Currently Amended) An image processing system for encoding and decoding an image, comprising:

an encoding device for encoding the image in units of bit planes to generate a code sequence; and

a decoding device for decoding the code sequence in units of bit planes to generate the image,

wherein noise on the image is removed by deleting data of bit planes of levels lower than a lower-limit bit plane in at least one of said encoding device ~~and/or~~ and said decoding device.

2. (Currently Amended) The system according to claim 1, wherein the lower-limit bit plane is determined on the basis of information that pertains to ~~the~~ an image sensing situation.

3. (Currently Amended) The system according to claim [[1]] 2, wherein the image to be encoded by said encoding device is an X-ray image, and

the information that pertains to an image sensing situation is an X-ray dosage.

4. (Original) The system according to claim 1, wherein said encoding device performs discrete wavelet transformation.

5. (Original) The system according to claim 4, wherein said decoding device deletes data of bit planes of levels lower than the lower-limit bit plane, of bit planes which belong to a predetermined subband.

6. (Original) The system according to claim 5, wherein the predetermined subband is a subband other than the lowest-frequency subband.

7. (Original) The system according to claim 1, wherein a bit plane decoding process is aborted at the lower-limit bit plane, and bits of transform coefficients contained in all subsequent bit planes up to a least significant bit plane are set at zero.

8. (Original) The system according to claim 1, wherein said encoding device generates the code sequence by decomposing transform coefficients generated by computing discrete wavelet transforms of the image into bit planes corresponding in number to the transform coefficients, and encoding in units of bit planes.

9. (Original) The system according to claim 1, further comprising a file generation device for generating a file by appending predetermined information that pertains to the lower-limit bit plane to the code sequence.

10. (Original) The system according to claim 9, wherein the predetermined information includes the name of a patient to be sensed, an image sensing date, an X-ray dosage upon image sensing, and information which pertains to the code sequence.

11. (Original) The system according to claim 1, further comprising an input device for sensing and inputting an image to be encoded by said encoding device.

12. (Original) The system according to claim 1, further comprising an image display device for displaying the image decoded by said decoding device.

13. (Original) The system according to claim 1, wherein said encoding device determines a region of interest in the image, and removes noise by deleting data of bit planes of levels lower than the lower-limit bit plane for only a region other than the determined region of interest.

14. (Original) The system according to claim 13, wherein said encoding device shifts up only the region of interest by a predetermined number of bits by multiplying data of the region of interest by a predetermined value, and

removes noise by deleting data of bit planes of levels lower than the lower-limit bit plane for the entire region after the shift-up process.

15. (Original) The system according to claim 14, wherein said encoding device determines the region of interest on the basis of a transform coefficient group included in the lowest-frequency range of transform coefficients generated by computing discrete wavelet transforms of an image.

16. (Original) The system according to claim 14, wherein said encoding device computes the predetermined number of bits to prevent levels of bit planes of the region of interest from overlapping levels of bit planes of a region other than the region of interest.

17. (Original) The system according to claim 14, wherein said encoding device computes the predetermined number of bits on the basis of an expected noise level.

18. (Original) The system according to claim 17, wherein the expected noise level is computed from the transform coefficient group contained in the lowest-frequency range.

19. (Original) The system according to claim 14, wherein said encoding device appends information indicating the predetermined number of bits to the code sequence.

20. (Original) The system according to claim 1, wherein said encoding device generates transform coefficients by computing discrete wavelet transforms of the image,

specifies a transform coefficient group of the lowest-frequency subband corresponding to transform coefficients in a subband other than the lowest-frequency subband in a positional relationship on the image, and

specifies a lower-limit bit plane of the transform coefficients in the subband on the basis of the specified transform coefficient group.

21. (Original) The system according to claim 20, wherein said encoding device computes an average value of the specified transform coefficient group, checks if the average value is not less than a predetermined value, and specifies the lower-limit bit plane of the transform coefficients in the subband in accordance with the checking result.

22. (Original) The system according to claim 1, wherein said encoding device generates the code sequence by forming layers using only bit planes not less than the lower-limit bit plane, and combining the layers.

23. (Original) An image processing system for encoding and decoding an image, comprising:

an encoding device for generating a code sequence by generating transform coefficients in units of a plurality of frequency ranges by means of frequency transformation of an image, and encoding the transform coefficients; and

a decoding device for restoring the transform coefficients from the code sequence, reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients, and removing noise by processing the transform coefficients of the frequency ranges other than the given frequency range on the basis of the reference image.

24. (Original) The system according to claim 23, wherein the given frequency range includes the lowest-frequency range of the plurality of frequency ranges.

25. (Original) The system according to claim 23, wherein the given frequency range includes a predetermined number of frequency ranges including the lowest-frequency range of the plurality of frequency ranges.

26. (Original) The system according to claim 23, wherein the process of the transform coefficients in said decoding device includes a comparison process for comparing with a predetermined coefficient, and a conversion process for converting a transform coefficient not more than the predetermined threshold value as a result of comparison to zero.

27. (Currently Amended) The system according to claim 23, wherein the process of the transform coefficients in said decoding device includes a level conversion process which is ~~done~~ performed on the basis of a predetermined function using the transform coefficient as a variable.

28. (Original) The system according to claim 23, wherein said decoding device executes the process on the basis of pixel values in a region of the reference image corresponding to the transform coefficients to be processed.

29. (Original) The system according to claim 23, wherein said decoding device executes the process on the basis of an average value of pixel values in a region of the reference image corresponding to the transform coefficients to be processed.

30. (Original) The system according to claim 29, wherein the pixel values are luminance values of pixels.

31. (Original) An image processing apparatus for encoding an image,

which generates a code sequence by encoding an image in units of bit planes, and removes noise on the image by deleting data of bit planes of levels lower than a lower-limit bit plane.

32. (Original) An image processing apparatus for decoding an image,

which reclaims an image by decoding an image in units of bit planes, and removes noise on the image by deleting data of bit planes of levels lower than a lower-limit bit plane.

33. (Original) An image processing apparatus for decoding an image,

which restores transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image, and reclaims a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients, and

removes noise by processing the transform coefficients of frequency ranges other than the given frequency range on the basis of the reference image.

34. (Currently Amended) An image processing method for encoding and decoding an image, comprising:

an encoding step, of encoding an image in units of bit planes to generate a code sequence; and

a decoding step, of decoding the code sequence in units of bit planes to generate an image,

wherein noise on an image is removed by deleting data of bit planes of levels lower than a lower-limit bit plane in ~~the~~ at least one of said encoding step ~~and/or the~~ and said decoding step.

35. (Original) An image processing method for decoding an image, comprising:

a step of restoring transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image, and reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients; and

a step of removing noise by processing the transform coefficients of frequency ranges other than the given frequency range on the basis of the reference image.

36. (Currently Amended) A computer program product embodying a program for implementing an image processing method for encoding and decoding an image, the program comprising:

program code for an encoding step, of encoding an image in units of bit planes to generate a code sequence; and

program code for a decoding step, of decoding the code sequence in units of bit planes to generate an image,

wherein noise on an image is removed by deleting data of bit planes of levels lower than a lower-limit bit plane in ~~the~~ at least one of said encoding step ~~and/or the~~ and said decoding step.

37. (Original) A computer program product embodying a program for implementing an image processing method for decoding an image, the program comprising:

program code for a step of restoring transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image, and reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients; and

program code for a step of removing noise by processing the transform coefficients of frequency ranges other than the given frequency range on the basis of the reference image.

38. (Currently Amended) A computer data signal embodied in a propagating wave and used for implementing an image processing method for encoding and decoding an image, comprising:

a code signal used in an encoding step, of encoding an image in units of bit planes to generate a code sequence; and

a code signal used in a decoding step, of decoding the code sequence in units of bit planes to generate an image,

wherein noise on an image is removed by deleting data of bit planes of levels lower than a lower-limit bit plane in ~~the~~ at least one of said encoding step ~~and/or~~ ~~the~~ and said decoding step.

39. (Original) A computer data signal embodied in a propagating wave and used for implementing an image processing method for decoding an image, comprising:

a code signal used in a step of restoring transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image, and reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients; and

a code signal used in a step of removing noise by processing the transform coefficients of frequency ranges other than the given frequency range on the basis of the reference image.